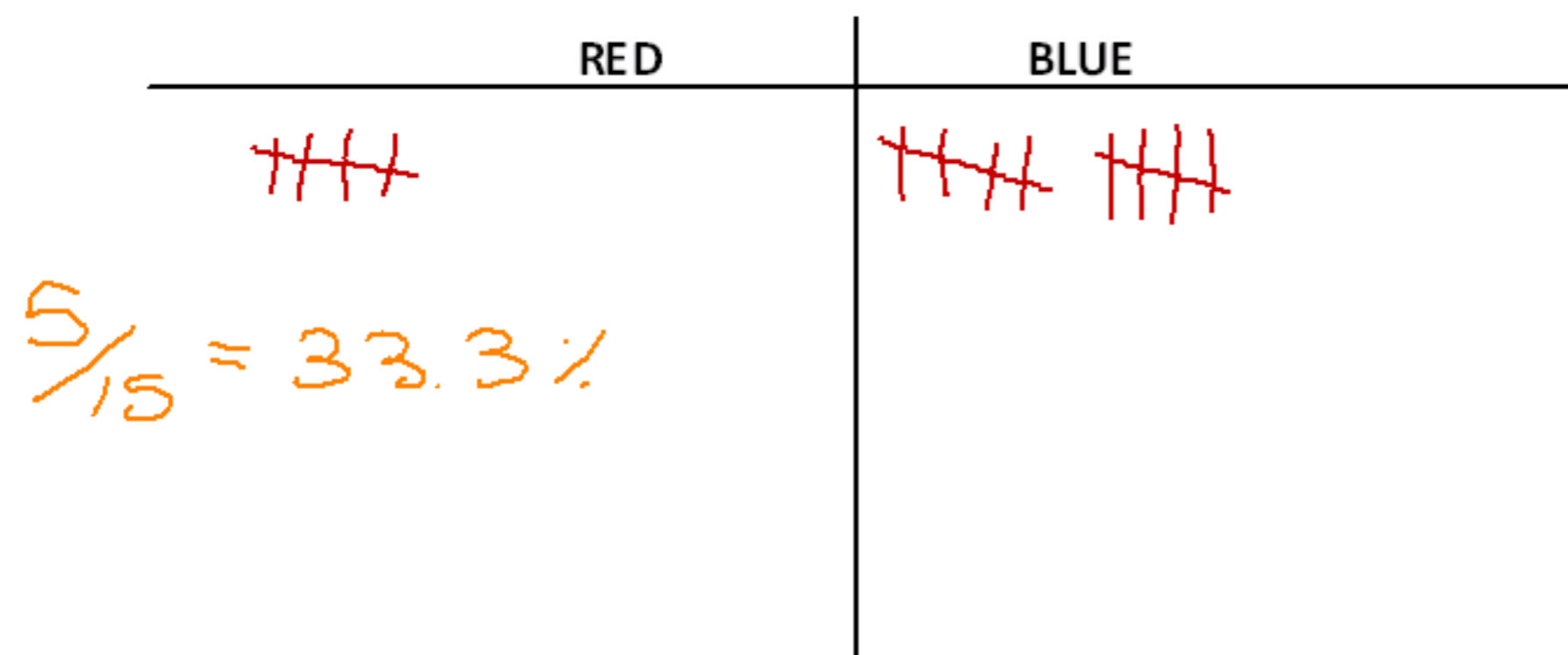


Experiment:
20 poker chips.
15 trials

n= 15
p= ?



What do you think the true proportion of RED is?

Why?

$\frac{1}{3}$

Experiment:
20 poker chips.
15 trials

n= 15
p= ?

RED	BLUE

$$\frac{3}{15} = 0.20$$


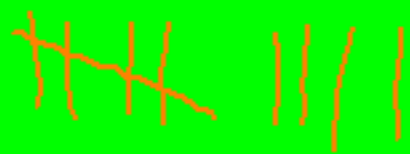
What do you think the true proportion of RED is?

$\frac{4}{15}$

Why? avg

Experiment:
20 poker chips.
15 trials

$n = 15$
 $p = ? \rightarrow \frac{5}{20} = 25\%$

RED	BLUE
	

$\frac{6}{15} = 0.40$

guess \pm wiggle room

What do you think the true proportion of RED is?

5	6	7
7	11	6

Why?

CHAPTER 8: Section 1

- What is Inference?

— making conclusions about pop from stats./data

Ex: prop. of red chips

- What is Formal Statistical Inference?

* add a known degree of conf.

The 2 most prominent types of Formal Statistical Inference are....

(1) Confidence Interval

guess \pm wiggle room

- this is used for.....

estimating a parameter
(take samples) (like p , or μ)

(2) Hypothesis tests

- this assesses.... evidence for/against a
claim about parameter

$p = \frac{1}{3}$ (take samples)

$\mu = 67$

Notes on Inference

- Inference is based on... samples

* sampling distributions (many samples)

- Inference gives us probabilities...

of what would happen
if we took many samples



- When we do inference, we are assuming that the data comes from...

* SRS

- good experimental
conditions

Formal Statistical Inference in general...

- take samples
- calculate stats
- estimate parameters
- make conclusions about pop

* with known degree of confidence

The whole purpose/goal of Statistics...

making concl.
about pop. from
data

*actuary - insurance

REVIEW:

Measuring	Statistic	Parameter
mean	\bar{X}	μ
standard deviation	S	σ
proportion	\hat{p}	p

$$\hat{p} = \frac{X}{n}$$

\leftarrow # successes
 \leftarrow total sample size

$$\frac{5}{15}$$

What types of problems have we learned that use p (proportions)?

Binomial

What check did we do when we did these problems?

$$np$$

$$n(1-p) \geq 10$$

Why did we do this check? In other words, if the check passed, what did that mean?

$$\hat{p} \sim \text{Normal}$$

What is $\mu_{\hat{p}}$?

p

Z-scores
normal dist

What is $\sigma_{\hat{p}}$?

$$\sqrt{\frac{p(1-p)}{n}}$$

Confidence Intervals

Confidence Interval:

- FORM:

estimate \pm margin of error

$n=1200$

- Example: Presidential Polls:

Barrack : $54\% \pm 3\%$

\uparrow (51%, 57%)

- Questions:

- \hat{p} is called an... estimator

- What parameter is \hat{p} estimating? p

- The margin of error shows...

how accurate we think our estimate is.

- The confidence level shows...

how confident you are that the interval contains the true parameter

$54\% \pm 3\%$ 75%

$56\% \pm 10\%$ 90%

- The two parts of a confidence interval are:

(1) interval (a,b)

(2) confidence level (%)

- This part gives the probability that.....

in repeated samplings
our interval catch/contain
the true param.

Ex:

95% conf: 95% of my samples

bad
sample

Ex: $\frac{10 \text{ refs}}{15}$ will have μ in them

Section 8.1: Confidence Interval for the Population Proportion

- Confidence Intervals are based on... *sampling distributions*
- Statistic = \hat{p}
- Parameter = ~~p~~ *← estimating*
- Check: $n \cdot \hat{p} \geq 10$
 $n(1-\hat{p}) \geq 10$
- If the check passes, then... $\hat{p} \sim \text{normal}$
- If \hat{p} is approximately normal then we can use...
z-scores, normcdf
- We will be taking a sample size n

FORMULA:

For a confidence interval of the population proportion

GENERIC

* statistic estimate $\pm (\text{crit val})(\sigma_{\text{stat}})$

means: $\bar{X} \pm (\text{crit val})\left(\frac{\sigma}{\sqrt{n}}\right)$

- What is Z^* defined as?

Z -score that has
___% of the data
between \pm .

- What is Z^* also called? critical value

- 3 most common levels of confidence for Confidence Intervals?

◦ 90% $\rightarrow Z = 1.645$

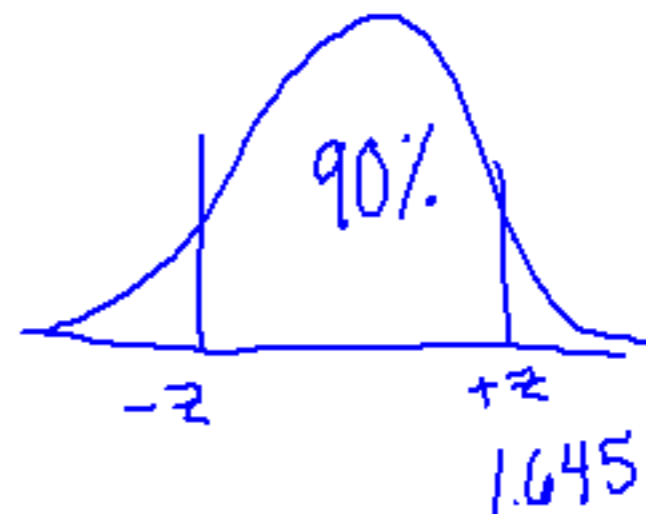
◦ 95%

◦ 99%

SPECIFIC to p

$\hat{p} \pm Z^* \underbrace{\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}}_{\sigma_{\hat{p}}}$

↑
estimate



How can we find Z^* for our level of confidence?

- For example, I want the Z^* for 90% confidence level- how can I find it??
(Look back to your review/warm up for Ch. 6)

3 Common Confidence Levels:

Confidence Level	90%	95%	99%
Z^*			

But what if we want a different degree of confidence than 90%, 95%, or 99%? How can we find the Z^* for those?

Way #1:

- Look at the tables in the back of the book
- Find Table D (page T-11)
- Down at the bottom of the chart, you will see "Confidence Level C" and a bunch of confidence levels right above it
- Look right above the confidence levels (the %s) and you will see the Z^* for those levels of confidence.

Way #2:

- Find the Z^* that have that % of data between them using a picture and the calculator function `invnorm()`.

Example: Find the Z^* for a 91% confidence level:

Using the formula for a Confidence Interval, and the information below, complete the following examples.

EXAMPLE #1:

Find a 95% confidence interval when we have $\hat{p} = 0.23$, $n = 200$.

EXAMPLE #2:

Alcohol abuse is said to be the #1 problem on college campuses today, and is a leading cause of death for 18-25 year olds. The National Board of Statistics is trying to estimate the percentage of college students that are binge drinkers. They took an SRS of 17096 college students and found 3314 were classified as binge drinkers. (*Note: binge drinking is defined as having 5 or more drinks in a row, 3 or more times in the past 2 week*)

Find a 90% confidence interval for the proportion of college students who are binge drinkers.

EXAMPLE #3:

Go back to the binge drinking example and find 95% and 99% confidence intervals.

95%:

99%:

Graph the intervals on the following number line, one on top of the other. What do you notice as the confidence level increases?



Interpreting Confidence Intervals

- Confidence intervals have 2 parts:

(1)

(2)

- The interpretation is

- It must use both

Form: *(of the sentence interpretation)*

****Go back to example #2 and interpret your confidence interval.**

Margin of Error:

- *What part of the formula for a confidence interval is the margin of error?*
- *Do we want a low or high margin of error?*
- *What 3 things can we do to lower the margin of error?*

(1)

(2)

(3)

Cautions/Assumptions:

- *A confidence interval is only correct in certain circumstances and with certain assumptions.*

Assumptions:

-
-
-

Cautions:

We can't use our confidence interval if the above assumptions aren't met. Also...

-
-

*Do the examples on the next page-
worksheet 8.1*